

TEMPORARY GROUP ON NATIONAL SUPPORT FOR BEHAVIORAL SCIENCE

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February 10, 1958

Honorable Allen W. Dulles  
Central Intelligence Agency  
2430 E Street  
Washington, D. C.

Dear Mr. Dulles:

The enclosed statement was prepared by a group of citizens who associated themselves to bring to public attention a present need.

We believe that basic research on human conduct will supplement what is being done in the physical sciences. The same rigorous exploration and testing applied to people could yield understanding of the human factors in national and world affairs.

We are sending National Support for Behavioral Science to members of the government and to the scientific community. We should be grateful for any comment you care to make.

Sincerely,

*James D. Miller*  
James D. Miller, M. D.  
Chairman

*ER*

**NATIONAL SUPPORT**  
*for*  
**BEHAVIORAL SCIENCE**

**February 1958**

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The present statement grows out of widespread concern that the national interest be adequately served by the development and application of behavioral science. This concern was recently voiced by various government officials and behavioral scientists in informal discussions. As a consequence of the expression of urgency, a group of behavioral scientists has prepared a brief set of observations and recommendations.

This small group, whose members are from many different sectors of behavioral science, came into being voluntarily in response to the expressed interest of government officials, and goes out of existence with this statement. We speak as individuals and not as representatives of any institutions or associations. Time available did not permit a canvass of professional opinion or a thorough survey of existing resources. It was not our objective to make this report comprehensive. We focus on behavioral science and obviously cannot touch on all pertinent fields. Moreover, our examples of research tasks are just that—intended to give concreteness and image to representative problems rather than to be a firm selection of research priorities.

We hope that this document will stimulate further thought and prompt action, equally on the part of our professional colleagues, government officials, and citizens generally.

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## NATIONAL SUPPORT FOR BEHAVIORAL SCIENCE

### Summary

The present situation facing our country calls for an evaluation of the role and potential contribution of behavioral science. This is the combined endeavor of many fields investigating all aspects of behavior, leading to understanding of human beings as individuals and in social relations. Behavioral science therefore includes many studies in the fields of anthropology, biochemistry, ecology, economics, genetics, geography, history, linguistics, mathematical statistics, neurology, pharmacology, physiology, political science, psychiatry, psychology, sociology, and zoology. Applications ramify into advertising, business administration, education, government, human engineering, labor relations, law, medicine, military science, operations research, personnel selection, public relations, and many other aspects of human endeavor. Some of these sciences are still in early stages of development, but American research in them at the moment has a clear lead over Russian, which is constricted by Communist dogma.

Behavioral science has demonstrated its usefulness to human welfare and national security. Its further development could increase its contribution in areas of international relations, military defense, and national vigor.

To accomplish these goals, the following recommendations are offered:

- I. Formation of an advisory panel of behavioral scientists to work closely with the Special Assistant to the President for Science and Technology. There is need for more understanding, backing, and use of behavioral science throughout the government and by the people of the United States, and for encouraging the scientists themselves in their research tasks.
- II. Provision of increased funds for behavioral science research, training, and facilities in the National Science Foundation, the Department of Defense, the National Institutes of Health, the Atomic Energy Commission, and other appropriate governmental and private agencies, in order to:
  - A. Establish additional university programs or institutes to conduct research in designated crucial areas.
  - B. Finance more fellowships, both predoctoral and post-doctoral, especially in all the social sciences.
  - C. Increase financial support for basic research in behavioral science.
  - D. Make available special facilities for behavioral science, including buildings and equipment.
  - E. Support centers devoted to foreign area studies.



## I. Nature of Behavioral Science

The United States finds itself today in a world situation which demands assessment of every resource of physical, intellectual, and moral power. In this memorandum a group of citizens examines the present state of behavioral science and how it can improve international relations and foster national intellectual and moral power. We identify areas in behavioral science where acceleration of understanding is feasible, and where application of such knowledge to our problems is crucial. Coming from divergent fields with necessarily different points of view, we nevertheless share unanimous conviction concerning the significance of these areas for human betterment and the urgency of expanding their support.

Behavioral science applies the methods of science—examination, measuring, testing—to man himself. As medicine draws from many sciences whatever knowledge concerns the health of people, so behavioral science draws from many fields what each can contribute to the central problem of understanding the behavior of man. It studies the actions of men, their relations to each other, and to nature.

Behavioral science, striving toward, but not yet attaining, unified theory, seeking precise quantification and accurate prediction of man's behavior, is young, and its subject matter is complex. We know more about heart disease than we do about mental illness. We know more about the laws governing the orbits of planets than the laws governing action and reaction of human groups. Many methods of behavioral science are still crude, yet much is known which, experience has shown, can be put to good use. Much behavior can be described systematically, and changes produced by altering features of the physical and social environments can be predicted. Sometimes a scientific approach pays off well, but to most practical problems the new sciences candidly admit they cannot give immediate solutions. Yet they may suggest the right questions to ask or indicate in what directions the answers lie.

Russia at present lags behind the West—particularly the

United States—in the biological, psychological, and social sectors of behavioral science. The biological and medical sciences in general have not been prosecuted in Russia with the zeal of some of the other natural sciences. Marxist doctrine has held back the social sciences, and an adherence to Pavlovian doctrines has retarded much of Russian neurophysiology and psychology. Political considerations have also limited objective investigation of human genetics.

In some behavioral areas basic Soviet science has been adequate, and in other areas research has been successfully applied, as in pedagogy. In general, however, undue stress upon immediate application has sharply restricted fundamental behavioral research.

The Soviet Government has interdicted the use of psychological testing methods and attitude surveys, methods most useful to democracies in probing the opinions of the people in order to aid government and planning activities. Also, ironically, behavioral science has been used least in the Soviet Union for precisely those purposes for which Americans popularly think totalitarian states would use them most: political propaganda and the control of human behavior for political purposes.

Though the West leads in accomplishments in behavioral science at present, and has more and better trained scientists, the fact that this field is at an early stage of development, here and in all other nations, means that we could be surpassed by a country which concentrated serious effort to that purpose, if we do not intensify our own efforts.

We must assume the probability of a breakthrough in the control of the attitudes and beliefs of human beings through exceptionally effective educational techniques, drugs, subliminal stimulation, manipulation of motives, or some as yet unrecognized medium. This could be a weapon of great power in Communist hands, unless comparable advances in the West produce effective countermeasures.

The democratic conviction of the dignity of man and his role in society is a point of view that stimulates development of be-

havioral science. Concern for the individual has traditionally set problems for philosophers, statesmen, and spiritual leaders. Human behavior represents a complex intermingling of moral and physical considerations, and there is an important region of overlap between behavioral science and the humanities, particularly history, languages, literature, philosophy, and religion. The sciences of man often build on and clarify the wisdom of the humanities, and attempt to formulate and test precise laws.

Before World War I it would have been difficult to point to many applications of basic research in behavioral science that were better than the common-sense judgments of competent individuals. Now there are instances in which basic research has led to important advances that have already had impact on society. These include: intelligence and aptitude testing; techniques to speed learning and increase the effectiveness of education; use of drugs in alleviating or curing certain mental illnesses; sample survey methods using mathematical statistics for measuring and predicting social trends; development of increasingly reliable economic indicators fundamental to planning in government and industry; use of group dynamics to improve the efficiency of face-to-face working groups; and many others. Such achievements make for widespread general acceptance—sometimes too enthusiastic and uncritical—of behavioral science.

Throughout the ages when man has gained more knowledge he has gained more freedom. His understanding of physical laws increasingly has enabled him to control the natural environment, protect himself from heat and cold, and travel speedily and comfortably. Expanding biological science has freed him from pestilences, most of the terrors of childbirth, the feebleness of malnutrition, many forms of pain and physical misery. His life span has been prolonged and made more healthy.

Similarly behavioral science, directly probing man's central nature, gives promise of increasing his degrees of freedom and expanding his effectiveness and creativity. He can be released from the constriction of life by neurosis and feeble-mindedness and the tragedy of psychosis; the limitation of opportunity from

inadequate education, associated prejudice and bias; the diminishing of contentment and effectiveness from marital strife, industrial unrest, crime and delinquency; and perhaps most of all, the fear of international conflict which constrains the free expression of the world's peoples. To these central problems of human existence the sciences of man ultimately address themselves.

We are coming to accept as likely in the future a sort of physical existence which would have been unimaginable a few years ago. But the potential benefits which can flow from basic study of our behavior are not so clearly seen. A chief purpose of this report is to present and urge these bright prospects.

## II. Illustrative Fields of Behavioral Research

A few examples of the many areas of basic research which can be applied to bettering human life are:

**a. Drug Effects on Behavior.** Beginning with the sedatives and anesthetic drugs, and dramatized at present by new tranquilizing and anti-depressant compounds, the field of psychopharmacology is developing with vast potential importance for understanding behavior. Chemicals are involved in brain activity and hormones affect behavior; compounds exist which can produce temporary psychotic states or lower resistance to communication of confidential information. Certain drugs, when injected into animals or man, can modify sexual behavior or subjective emotions. The fundamental significance of all this is that clues are rapidly unfolding which give us entirely new insights into the biological determinants of actions, feelings, and reasoning processes. The wide range of possible industrial and medical uses is apparent.

**b. Creativity.** Among the highest traits is the ability to produce new intellectual discoveries and artistic products. Such novelty invests life with richness. Methods are being developed for investigating the creative processes of geniuses and others of

unusual ability, as well as the effects on them of early experiences and other influences. Quantitative techniques are being worked on for measuring and analyzing inventive processes of discovery. The conditions under which creative activity flourishes and the role of emotions in aiding or blocking it also are being investigated. All this work can lead to expansion of horizons of satisfaction for the artist and creator as well as for those who profit from their endeavors.

**c. Human Performance Capabilities and Limitations Under Stress.** While the capabilities and limitations of human beings under normal conditions of work have been extensively studied, little is known about them under extreme work conditions or stress. Nor is much known of techniques of training, motivation, environmental aid, or pharmacological support for individuals who must be required to undergo extreme conditions while maintaining high proficiency on the job. Examples of such extreme conditions are: long stretches of continuous confinement in atomic submarines or space vehicles; absolute or relative isolation of individuals or small groups; pressures of responsibility in high governmental office; extremes of tropical heat or arctic cold; enemy-applied insults to body and mind; and information input overload. Basic research effort is needed to explore not only the limits of human capability under stress, but also the techniques that may be used to improve performance under such influences.

**d. Personnel Utilization.** Much research in behavioral science has been and can be done on the problem of putting the right man in the right job in the armed forces, industry, civil service, or elsewhere. Such investigations define the human tasks to be performed, the jobs and organizations of men required for the accomplishment of those tasks, the kinds and numbers of men that must be recruited, the types and amounts of training they must be given, the standards of performance that must be met, the differentiation of careers that must be offered, and the criteria for the promotions, separations, and reassignments of men that must be effected. Psychiatry and psychology have made major

contributions by providing instruments for the selection and classification of men in terms of aptitude, by defining effective techniques of training, by producing improved measures of job performance, and by providing systematic procedures for the anticipation of human skill requirements in new and untried situations. Social psychology and sociology have made contributions to the solution of problems of human relations, morale, leadership, and the management of human organizations. Nevertheless, the full potential of these sciences for improvement of the effectiveness and economy of management and administration in all fields has not been realized.

The demands that will be placed on military and civilian personnel management systems of the future cannot be fulfilled without full application of behavioral science. The industrial or military organization of the future will require highly selected, thoroughly trained, and technically skilled men who most often must operate as members of closely knit teams in conjunction with extraordinarily complex machines. In the most crucial of their activities, they must perform their functions with precision and wisdom of decision. Further, in military situations they may have to act under the stresses of isolation, vigilance, and unusual environmental conditions, operating in dispersed locations and in small groups in which problems of military organization and management, as well as leadership, will come in novel forms.

**e. Decision Process.** The role of man in the last half of this century will increasingly be that of an information processor and decision maker. Heavy demands will be placed on human beings at various levels—not only top administrators—for correct, closely integrated, vital decisions. The theory and empirical analysis of human decision processes have been vigorously pursued during the last ten years, with promising progress. However, gross deficiencies exist in basic understanding of the process, the conditions for its efficient operation in different contexts of information scarcity and information overload, and the conditions of efficient selection or training of individuals for decision making.

**f. Group Functioning.** Recent advances in behavioral science have made important contributions to our knowledge of man as a social being. Modern techniques of cooperation in industry, science, and warfare emphasize a greater reliance upon small groups of men functioning semi-autonomously and integrated into larger operations only through complex and sometimes vulnerable communication systems.

For a small group to be efficient, each member must contribute the particular technical and social skills expected of him. Basic research on group functioning will almost certainly yield important general principles for group assembly, training, and management, because a number of the technical tools and concepts needed for this effort are now available.

**g. Measurement of Economic Process.** Much of the strength of any society derives from its monetary policy and the effectiveness of its labor and management, its production, distribution, and consumption. Theory in this field has become more sophisticated with the years, and theories have been confirmed or destroyed by new measurement techniques based on masses of statistics, painstakingly collected. Recently new methods of econometric analysis of broad economic systems and economic decision making have been developed. Much that can profit national and international trade can be done to make this field more empirical and even experimental. Measuring the effects of psychodynamic factors on consumer preferences, of political boundaries on the flow of trade, of morale factors on fluctuations in stock values, and of numerous other related elements can eventually put our understanding of economic matters on a basis of more precise science, and so aid in the effective mobilization of resources.

**h. Cultural Differences and Change.** The varied customs and different ways of life of the peoples of the world pose complex intellectual and practical problems. The extent to which these ways of life or cultures constitute systems as opposed to mere aggregates of customs is undetermined. If, as most anthropolo-

gists agree, culture are systems, perhaps the principles of their growth and decay can be scientifically formulated. Theory construction has begun and provisional generalizations are in sight.

The facts of cultural differences and rapid social change present difficulties to American programs of foreign aid and diplomatic or other communication with peoples abroad. Consequently, it is urgent that we develop a scientific understanding of our own and other ways of life. The use of surveys and other procedures of behavioral science can vastly improve our international intelligence activities. Many of the needed facts are already available in the Human Relations Area Files and other sources, but techniques for formulating sound theory and applying it in policy are still to be developed.

**i. Man-Machine System Design.** During the past ten years behavioral science has been employed with increasing effectiveness in the design of man-machine systems. It has influenced choices of components like dials and signals, levers and controls, and formulation of procedures to coordinate man and machine in accomplishing an integrated purpose. The advances in technology of mechanical components, such as electronic computers, however, have led to rapid increases in system complexity so that the available knowledge about the capacities and limitations of man in man-machine systems has become more and more inadequate. This is true for automatic manufacturing equipment, large-scale traffic control techniques, manned space vehicles, systems for the surveillance of combat areas, and those which automatically collect and process information. In part, this deficiency results from the fact that only primitive methods are available for comparing the effectiveness of systems in which human beings and equipment must be coordinated. In part, the deficiency is attributable to inadequate scientific information about man's perception, memory, reasoning, and decision-making capabilities.

The joint participation of systems engineers and behavioral scientists in basic research on man-machine system design and use, and the provision of adequate system simulation facilities for such purposes, are necessary for advance in this field beyond present rule-of-thumb methods.

### III. Personnel and Financial Support for Behavioral Science

Behavioral science has grown principally in the universities rather than in applied or professional settings. Well established graduate training programs are found in 40 to 50 American universities, and at least 20 of these may be judged clearly superior.

The number of talented persons who enter and complete graduate training in behavioral science is now limited by the shortage of fellowships and assistantships. A recent report of a National Science Foundation 1954 survey presents the following analysis of all forms of support (teaching assistantships, research assistantships, and fellowships from educational institutions, the Federal Government, and other sources):

<i>Field</i>	<i>Per cent of resident students with stipends</i>	<i>Median stipend</i>
Physical Sciences.....	58	\$1360
Biological (Life) Sciences.....	62	1395
Psychology.....	31	1185
Social Sciences.....	24	1065

The Federal Government, by its present programs of fellowships and research grants, is contributing to this imbalance:

<i>Field</i>	<i>Number receiving Federal support</i>	<i>Per cent of resident students</i>
Physical Sciences.....	3399	18
Biological (Life) Sciences.....	1696	13
Psychology & Social Sciences..	512	2

While it is desirable to augment the federal support of graduate training in all the sciences, it is clear that the greatest deficiency is in the social sciences. The 1954 survey disclosed that there were, in the social sciences, excluding psychology, only 15 students with Federal fellowships, and only 95 assistantships on Federally financed research projects. There has been no substantial change in these figures in the subsequent years.

Financial support for university research in behavioral science comes from university funds primarily, and from private

foundations and government. The 1954 study conducted by the National Science Foundation reports total support of social science and psychology as 19 million dollars, and of biology as 34 million. Of this total, Federal Government funds constitute 42 per cent in social science and psychology and 53 per cent in biology, as compared with 84 per cent in physical science.

The number of college graduates who are professionally employed in the psychological and social sectors of behavioral science is estimated at 55,000, and in the biological sector, slightly more. Of these, one-third have received graduate education to the Ph.D. degree. Together these constitute two-fifths of the nation's scientists.

More than half of the behavioral scientists are engaged primarily in college teaching. The remainder are employed in government, business, industry, schools, and so forth. The proportion active in research, except in biology, is less than in physical science.

Basic research, as distinguished from applied research and development, is essential for the maintenance and continued growth of any scientific field. The requirements for basic research, and the desirable conditions for fostering and supporting it, were presented in the National Science Foundation 1957 report on basic research. Its recommendations for minimum restrictions on the freedom of the scientist, for long-term program-type grants instead of specific project grants, and for integration of outside supported research with the training of graduate students, are equally appropriate for behavioral as for all science.

The support of behavioral science by universities and foundations is predominantly for basic research. This is not true of Federal support, which is greater for applied research, especially in social science. The following table shows Federal expenditures for 1957, in millions of dollars:

<i>Field</i>	<i>Total basic and applied research</i>	<i>Basic research</i>	<i>Per cent basis</i>
Physical Sciences.....	647	143	22
Biological (Life) Sciences...	281	70	25
Social Sciences.....	35	4	13

Although Federal support for basic social science research comes from several departments and agencies (especially the Department of Defense and the National Institute of Mental Health), the National Science Foundation which is specifically charged with support of basic research, reports grants totalling \$382,000 in 1957 and about \$600,000 in 1958.

#### IV. Examples of Program Needs for Behavioral Science

Most of the research in behavioral science is conducted by individuals working alone or associated with a few colleagues or students. It is desirable to maintain the freedom and diversity which characterize such work. At the same time it is desirable to support the mixed strategy of establishing a number of programs or institutes, organized primarily in universities, which carry out broad and continuing researches focused on a defined target area.

In areas where the capabilities or interests of individual scientists do not result in sufficient research to meet the recognized need, it is desirable to foster more organized efforts. Further study needs to be directed to identifying such crucial research problems and supporting institutes or research centers to work on them. A few examples are given:

**a. An institute for the formulation of general behavior theory.** A carefully selected group of behavioral scientists from different specialties would work together intensively for an extended period to hammer out a provisional theory of behavior, interrelating the hypotheses and findings from different fields.

People who imagine that they operate without any theory about motivations and behavior are as naive as Molière's character who spoke prose without realizing it. Even the most practical people have their individual theories of human nature and con-

stantly act upon them. The trouble is—and this includes most of the behavioral scientists most of the time—that these theories are incomplete (do not embrace what is scientifically established or highly probable and relevant) and are not explicitly stated or subjected to critical scrutiny.

In recent years groups of behavioral scientists have made useful efforts to pool their tested knowledge and construct an economical, unified theory. These undertakings have been impeded by the press of day-to-day teaching, administrative, and research responsibilities. It will be a great value to detach—on a high priority basis—the best possible people (perhaps twenty) completely from such routine duties, put them in a somewhat isolated location, and give them all necessary secretarial, library, and research assistant facilities.

**b. Additional foreign area study centers beyond those that at present exist in American universities.** Such centers serve to extend the resources for training in the language and culture of foreign countries, and to provide good recruiting grounds for personnel who would eventually be drawn into government service. These centers also conduct active programs of research in the history and current status of political, economic, and social developments in the area, and in the problems of technological and social change, and may maintain close contact, through conferences, advisory panels and other procedures, with the problems and needs of the governmental agencies concerned with foreign programs, intelligence collection, and policy formation.

**c. A program for the study of processes such as concept formation, logical problem solving, thinking, and decision making, including the use of electronic computers to simulate the theoretical models of such functions.**

**d. A program on the use of social statistics in the development of theories of social change and the prediction of future trends.** In the field of economics the work of the National Bureau of Economic Research and of the Brookings Institution

has yielded concepts and methods which have become important in Federal economic policy. Although there is not now any systematic effort to conduct comparable research in the social field, the need is acknowledged. The Federal Government now collects some of the needed data and could collect more if there were a solid basis for knowing what would be useful.

**e. An institute for the study of the identification, motivation, and education of talented students for useful careers in our society.** The most effective use of the nation's brainpower would be supported by research on occupational aptitudes, conditions for fostering creativity, evaluation of special educational programs for the gifted, and so on.

## V. Tools and Techniques for Behavioral Science

There has been great advance in the tools and techniques used in behavioral science. These include: Microelectrodes that are so small they can penetrate and make electrical recordings of a single cell in the brain and still not disturb its functioning. Computers which can simulate some aspects of behavior, and computers which can speedily analyze social data of a complexity heretofore unapproachable. Radioactive tracers to study function of the nervous system. Game theory—a mathematics of decision making, maximizing profit while minimizing loss. Survey centers with nationwide field staffs. Electrically controlled apparatus enabling animals to choose how much drug or current they will apply to a particular brain center penetrated by a microinstrument. Quantitative means for measuring the content of information in flows of conversation. Electronic filters for separating the frequencies of speech which convey feelings from those which convey ideas. Many of these techniques are costly compared with the methods used in the study of man by the solitary investigators of a few decades ago.

With such tools behavioral scientists can investigate crucial areas, vital concerns of individuals and society in our nation and the world. In so doing they will attack some problems novel even to those acquainted with the classic status of these fields only a few years ago.

Because the needs of behavioral science for research facilities are different from the more traditional laboratories of the physical sciences and the libraries of the humanistic studies, they have not been so easily recognized and met. But the current developments of experimental and quantitative methods, and the requirement to study social behavior in real-life situations where it occurs, make clear the need for major research installations whose cost is beyond the means of most universities.

While a systematic analysis has not been made of facility requirements, a few examples may be given:

**a. Electronic data storage and retrieval mechanism for the Human Relations Area Files, a compendium of categorized information on several hundred societies of the world.**

The data collection and classification have been continuous over the past 15 to 20 years, and much of this work has been supported by grants from the military departments. The use of new data-processing methods for the hundreds of thousands of items seems worthy of exploration.

**b. Electric computer centers, needed for behavioral science research, just as for other areas.**

**c. Laboratory for research on primate behavior, with facilities for breeding and care of large numbers of animals.**

The study of monkeys and apes has shown promise for many aspects of behavior (such as thought processes, genetics of behavior, and controlled infant environments) for which other animals are not so suitable.

**d. Survey research facilities are essential for many kinds of research.** The maintenance of a well-trained national field staff, however, is too expensive for any university to support.

## VI. Contributions of Behavioral Science to Fostering The Peace

President Eisenhower has asked for a "science for peace." The issues which can be attacked by behavioral science are the human ones whose solution can guide world affairs along the course from cold war to ultimate peace. These are the most crucial of the many applied problems to which the sciences of man address themselves.

Professor I. I. Rabi recently stated this need clearly and forcibly:

We have to solve the problem of living together on this planet or we won't live. By we, I mean the major part of the globe, the United States, Russia, and other nations. The end of our national existence is in sight unless we solve the problem.

There has been almost no systematic research in behavioral science concerning international relations and diplomacy, negotiation, the prevention of war, or the operation of arms control systems. Yet our most striking diplomatic successes have been mixtures of technology and politics. Such was our open-skies proposal and our atoms-for-peace plan. Human technologies can also be employed. Behavioral scientists could make a specific contribution in this.

Immediate efforts toward national defense should be paralleled by research to discover methods for achieving more permanent and satisfactory means of international agreement. Such discoveries would provide greater security for peoples generally than the invention of any new weapons system.

This is a mission which demands all the wisdom and imagination that behavioral scientists can bring to bear. It is aimed at operating upon the causes rather than the means of war. This can involve efforts to alter the attitudes which create tensions among nations. It also can include objective studies of what

other peoples really think of us; clarification of our own self-image and aspirations; scientific devising of our information programs; development of assistance programs to suit the culture of receiving countries; and reduction of the stress on underdeveloped nations we aid, which results from technological change. All these very practical issues in relieving international tensions are vital and researchable, but they are receiving little attention.

## VII. The Place of Behavioral Science in National Defense

Though not the application of greatest human hopefulness, certainly the military uses of behavioral science lead all the others so far in the amount of Federal money expended. For example, during World War II, there were many accomplishments. Standardized tests of ability markedly improved the efficient selection of officer candidates. In the Air Corps training failures were reduced from 61 per cent to 36 per cent. The Army's research division developed techniques for screening potential psychiatric casualties among military recruits. Naval psychiatrists were able to improve the rate at which such casualties were returned to duty. At the beginning of the war, only 5 to 10 per cent of psychiatric casualties could be returned to duty, but with the use of new methods, psychiatrists could salvage 60 per cent for front line duties in 2 to 5 days and an additional 30 per cent for service in rear areas. Some problems were even demonstrated to be non-existent. For example, there was much talk about the causes of absenteeism among workers in war industries. A survey established the fact that there was little or no absenteeism not attributable to such normal causes as sickness, women having to say home to take care of children, and so forth. More effective methods of convincing Americans to buy war bonds were inaugurated. Certain testing devices used in selecting American

troops were later found to correlate positively with aspects of their combat performance. Engineering psychologists aided in the design of weapons and equipment. Anthropologists successfully predicted the morale of the Japanese population. The list could be extended at length.

Each of the areas of basic investigation mentioned earlier in this report has military implications, and as the methods of war grow more efficient the need increases for more precision in understanding behavior of men in military systems. Selection of the right personnel; training; management and leadership; and the maintenance of cooperation and morale—all these are everyday problems which become more acute in military life. Brainwashing; psychological warfare and countermeasures; obtaining, processing and evaluating of intelligence—these are problems of special importance to the armed forces. The functioning of man, with his limitations, in planes moving faster than sound or in electronic detection systems supplying information at great speeds; effects on him of low oxygen, extreme cold, high gravity, weightlessness, cosmic radiation; the emotional stability of men on long missions in isolation, or under great stress of decision responsibility—all these are problems for behavioral research. They can arise in other walks of life but are particularly pressing in the military situation of new weapons, new strategies, and new possible battlefields in space.

As weapons develop from jet planes to space ships, from atomic cannon to ICBM's, from independent fighters to intercontinental electronic warning systems, the demands on man will usually increase. Gross variability in human performance once was acceptable in war, because so many other factors fluctuated. But in modern weapon systems the greatest source of error is man, and consequently a precise science of his acts is urgently required. The newness of our defense problems requires imaginative re-examination of old assumptions and non-traditional research on the human factors in war.

## VIII. Contributions of Behavioral Science to the National Strength and Spirit

The strength of a nation depends on its technical and material assets, and on the scientific research which constantly expands these physical resources. But national strength is equally dependent upon human factors which determine how effectively physical resources are used: the health, morale, and motivation of the population, as well as the formal and informal organization of the society. The well-being and happiness of its citizens are goals of a democratic society, rather than mere means for the attainment of greater material strength. And the productivity of society is dependent upon all these human factors, which are the subject of study of behavioral science.

Americans are still only dimly aware of the central role our educational system plays in our present way of life and in our future development. Fortunately President Eisenhower's "safety through strength" program stresses education as one of its main points. His recommendations on education include the selection and guidance of the gifted and the evaluation of methods by which they are trained. These tasks demand the collaborative efforts of behavioral scientists and educators.

The population of the United States will increase and automatized technology will expand so that in a few years there will be enough manpower, but not enough highly trained manpower. This situation can be expected to continue for the next 10 to 20 years. The qualitative shortage will come from failure to provide scientific and technical education in our public schools rather than from scarcity of pupils with capacity for such education.

Future developments may force Americans to undergo significant changes in attitudes toward: expenditures for national

defense; alertness to the possibility of major emergencies; resistance to enemy psychological warfare; and acceptance of the necessity of a professional military force. These will be achieved only through modification of long-established traditional attitudes, a process calling for careful study in behavioral science. Again, in the event of war, one of the gravest dangers is loss of morale, despair or actual panic. These might be brought about by sudden crisis, or by a slower deterioration of military position coming, nevertheless, too rapidly for the people to adjust.

There might be loss of faith in our own strength or capacity to resist attack or alarm over radiation from fallout or astonishment at an unforeseen collapse of the economy. Additional research in behavioral science is needed to enable us better to forecast such reactions and to mitigate their consequences.

Another rapidly developing field is that of human relations in labor and industry, which can increase the general productivity of the country. It is important to support needed basic research in this area, which probably cannot or will not be directly supported by industry or labor.

In many ways the primary internal social and medical problem of America is mental disease, broadly defined. We have 750,000 people shut away from productive existence. There is a much larger number unable to make their expected contributions to society or even to live happily with themselves. Nor can they live happily with others; witness such problems as divorce and juvenile delinquency, racial and ethnic strife.

There is a special role, also, that behavioral science can play in all research. In science education, selection of scientists, organization of research groups, and encouragement of research creativity, the problem is fundamentally one of behavioral science rather than natural science, even though it may concern the development of engineers, mathematicians and physicists.

We have catalogued in the preceding paragraphs a few areas in which a democracy has a natural interest in behavioral science.

Fear of the Russians, and measures we must take to meet the Soviet challenge, are not the only motives for supporting such research. Preservation of our advantages and sharing them with the world are other motives even more compelling than fear of a strong enemy. Whatever the motive, the conclusion is the same: the United States must be strong physically and morally, and therefore needs to pursue such investigations in behavioral science as will contribute to this strength.

Copies of this statement may be obtained from:

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